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(54) SYSTEME DE SYNTONISATION RAPIDE
(54) FAST TUNER SYSTEM

(57)

An audiovisual display system providing a fast tuner system includes a display, a plurality of tuners adapted for connection to a source of information, and a selector coupled to the plurality of tuners to selectively couple one of the plurality of tuners to the display. A control system is coupled to the plurality of tuners and the selector for toggling the selector in response to channel change instructions to cyclically couple one of the plurality of tuners to the display. When a first tuner of the plurality of tuners is coupled to the display in response to a first sequential channel change instruction, the control system preemptively tunes a second tuner of the plurality of tuners to a sequential channel, whereby when a second sequential channel change instruction is received, the control system toggles the selector to couple the second tuner of the plurality of tuners to the display. The system may be a television including one or more internal tuners and/or an external tuner, such as a VCR.

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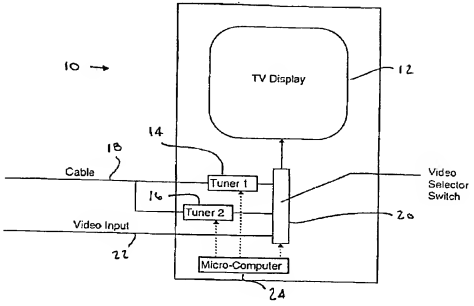
(54) **SYSTEME DE SYNTONISATION RAPIDE**
(54) **FAST TUNER SYSTEM**



(57) An audiovisual display system providing a fast tuner system includes a display, a plurality of tuners adapted for connection to a source of information, and a selector coupled to the plurality of tuners to selectively couple one of the plurality of tuners to the display. A control system is coupled to the plurality of tuners and the selector for toggling the selector in response to channel change instructions to cyclically couple one of the plurality of tuners to the display. When a first tuner of the plurality of tuners is coupled to the display in response to a first sequential channel change instruction, the control system preemptively tunes a second tuner of the plurality of tuners to a sequential channel, whereby when a second sequential channel change instruction is received, the control system toggles the selector to couple the second tuner of the plurality of tuners to the display. The system may be a television including one or more internal tuners and/or an external tuner, such as a VCR.

ABSTRACT

An audiovisual display system providing a fast tuner system includes a display, a plurality of tuners adapted for connection to a source of information, and a selector coupled to the plurality of tuners to selectively couple one of the plurality of tuners to the display. A control system is coupled to the plurality of tuners and the selector for toggling the selector in response to channel change instructions to cyclically couple one of the plurality of tuners to the display. When a first tuner of the plurality of tuners is coupled to the display in response to a first sequential channel change instruction, the control system preemptively tunes a second tuner of the plurality of tuners to a sequential channel, whereby when a second sequential channel change instruction is received, the control system toggles the selector to couple the second tuner of the plurality of tuners to the display. The system may be a television including one or more internal tuners and/or an external tuner, such as a VCR.

DESCRIPTION

FAST TUNER SYSTEM

FIELD OF THE INVENTION

The present invention relates generally to audiovisual display systems, such as televisions, and more particularly to an audiovisual display system having two or more tuners and a control system for providing fast tuning during sequential channel changes, and rapidly displaying information from sequential channels.

BACKGROUND

Various forms of audiovisual display systems which display information received from electromagnetic transmissions are known in the art. One common example is a television set which is used to display information received from broadcasters and the like via over-the-air transmissions, from cable systems, or from other sources of information. Television sets includes a tuner which receives a signal from the source of information and delivers a video signal corresponding to a selected channel to a television screen or display.

More recently, some television sets have included two tuners, for example in picture-in-picture (pip) systems where one tuner provides information for the main display while the other tuner provides information for a reduced sized picture. Such televisions include a video selector switch which selectively couples one or both of the tuners to the television display. When a channel change instruction is received for one of the tuners, the selected tuner is re-tuned and then may be coupled (if not already) to the display in response to the instruction.

However, because each tuner is tuned only when a new change channel instruction is received for that particular tuner, the fastest that conventional dual tuner televisions, can change channels is the time required for a single tuner to completely re-tune, similar to single tuner televisions. This delay may be particularly noticeable and inconvenient when a television user is "channel surfing," i.e. rapidly changing through the channels in sequence. When a channel change signal is received by the television, the user must wait

until the selected tuner has time to completely re-tune to the new channel before the user can view it and determine whether to continue along the sequence of channels.

Accordingly, there is a need for an audiovisual display, such as a television, which rapidly tunes faster than conventional televisions to speed up the time to change channels,

SUMMARY OF THE INVENTION

The present invention is directed to an audiovisual display, such as a television, with a fast tuner system for reducing the time to change channels, particularly during sequential channel changes. The audiovisual display system in accordance with the present invention generally includes a display, a plurality of tuners adapted for connection to a source of information, and a selector coupled to the plurality of tuners to selectively couple one of the plurality of tuners to the display. A control system is coupled to the plurality of tuners and the selector for toggling the selector in response to channel change instructions to cyclically couple one of the plurality of tuners to the display. Preferably, when a first tuner of the plurality of tuners is coupled to the display in response to a first sequential channel change instruction, the control system is adapted to preemptively tune a second tuner of the plurality of tuners to a sequential channel, whereby when a second sequential channel change instruction is received, the control system toggles the selector to couple the second tuner of the plurality of tuners to the display.

The audiovisual display system may also include a user interface, such as a remote control including an input for providing sequential channel change instructions, adapted to provide channel change instructions to the control system. In one preferred embodiment, the audiovisual system is a television set having two or more internal tuners controlled by the control system. Alternatively, the television may include one or more internal tuners and an external tuner which may be detachably coupled to the selector and the control system, such as a VCR.

In accordance with a method of using the fast tuner feature of an audiovisual display system of the present invention, the process of fast tuning is triggered when a first signal indicative of a channel change is received. In response to the first signal, the control system detects a channel change instruction in the first signal, and a first tuner is coupled to the display (which may be re-tuned to the indicated channel or may be

preemptively tuned to it). If a sequential change instruction, such as channel up, channel down or selection from a favorite channels list, is detected in the first signal, the second tuner is preemptively tuned to a sequential channel. If the audiovisual display includes a third tuner, the third tuner may also be preemptively tuned to another sequential channel when a sequential channel change instruction is detected in the first signal.

When a second signal indicative of a channel change is received, the control system tries to detect a selection pattern, preferably by comparing the first and second signals to detect whether the first and second signals include the same sequential channel change instruction. If a selection pattern is detected, i.e. the first and second signals include the same sequential channel change instruction, the second tuner is coupled to the display without having to wait for it to re-tune. The decoupled tuner, i.e. the first tuner, may then be preemptively tuned to another sequential channel in anticipation of a third sequential channel change instruction.

Thus, the control system of an audiovisual display system in accordance with the present invention cycles through the tuners, preemptively re-tuning one or more decoupled tuners in response to sequential channel change instructions in anticipation of similar sequential channel change instructions being received. This allows the time lapse to show information on the display due to re-tuning to a selected channel to be substantially reduced compared to single tuner systems or systems without this method of control.

Accordingly, a principal object of the present invention is to provide an audiovisual display system having multiple tuners that may be cyclically and preemptively tuned, for fast tuning the system during sequential channel changes.

Other objects and features of the present invention will become apparent from consideration of the following description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic view of a first preferred embodiment of a fast tuner television system in accordance with the present invention.

FIG. 2 is a schematic representation of time required for channel changes in the audiovisual system of FIG. 1.

FIG. 3 is a schematic view of a second preferred embodiment of a fast tuner television system in accordance with the present invention.

FIG. 4 is a schematic view of a third preferred embodiment of a fast tuner television system in accordance with the present invention.

FIG. 5A through 5C are schematic representations of time, comparing the time required for channel changes in a one, two and three tuner system respectively.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Turning now to the drawings, FIG. 1 shows a first preferred embodiment of a fast tuner television 10 in accordance with the present invention. The television 10 includes a conventional display 12 and a pair of internal tuners 14, 16 (identified as Tuner 1 and Tuner 2 respectively), the tuners 14, 16 each being connected to a source of information 18, such as a conventional source of cable television signals. The tuners 14, 16 are also coupled to a video selector switch 20 which is adapted to selectively couple one of the tuners 14, 16 or a video input 22 to the display 12.

The television 10 includes a control system 24, preferably a micro-computer, coupled to the tuners 14, 16 and the video selector switch 20. Alternatively, the control system 24 may include a sequencer, one or more analog or digital devices and/or discrete or integrated components, as will be appreciated by those skilled in the art. Preferably, the control system 24 is responsive to a user interface, such as a remote control device (not shown). The television 10 may include a receiver (not shown) coupled to the control system 24 to receive output from the remote control device, such as infrared radiation bearing information regarding television control, as is known in the art.

The control system 24 is adapted to alternately tune the tuners 14, 16 and/or toggle the video selector switch 20, thereby alternately coupling one of the tuner 14, 16 to the display 12, to display a selected channel received from the source of information 18 on the display 12. Most preferably, when one of the tuners, for example Tuner 1, is coupled to the display 12 in response to a first sequential channel change instruction, the control system 24 directs the other decoupled tuner, i.e. Tuner 2, to preemptively tune to a sequential channel in anticipation of receiving a second sequential channel change instruction, whereupon the control system 24 may toggle the video selector switch 20 to

couple the decoupled tuner, Tuner 2, to the display 12, as explained more particularly below. In addition, the control system 24 may include memory (not shown) for storing a previous channel change instruction and/or a comparator (not shown) for comparing channel change instructions to detect selection patterns.

During use, the operation of the television 10 generally proceeds as follows. A first signal is received indicative of a channel change, for example, from a remote control device controlled by the television user. The control system 24 couples a first tuner (e.g. Tuner 1) to the display 12 in response to the first signal. The first tuner may already be "preemptively" tuned to the selected channel as explained below, or may be re-tuned when it is coupled to the display 12. The control system 24 detects whether the first signal is a sequential channel change instruction, such as channel up, channel down, or a favorite channel selector, e.g. super quick view (SQV). If a sequential channel change instruction is detected, the control system 24 re-tunes the second or decoupled tuner (Tuner 2) to the next channel in the sequence, i.e. "preemptively" tuning the second tuner in anticipation of receiving another similar sequential channel change instruction.

When a second signal indicative of a channel change is received, the control system 24 compares the first and second signals to detect a selection pattern, i.e. whether the second signal is the same sequential channel change instruction as the first signal. If a selection pattern is detected, the second tuner (Tuner 2) is coupled to the display 12 and the first tuner (Tuner 1) is decoupled, thereby displaying the information from the second tuner without having to wait the time required to re-tune to the desired channel. In addition, the control system 24 preemptively tunes the first or then-decoupled tuner (Tuner 1) to the next channel in the sequence. When a third signal indicative of a channel change is then received, the control system 24 repeats the steps described above, comparing the third signal to the second signal, coupling the decoupled tuner (Tuner 1) if a selection pattern is detected, and then preemptively tuning the then-decoupled tuner (Tuner 2).

With reference to FIG. 2, a diagrammatic view of the time for channel changing is shown when employing the present invention, generally showing time proceeding from left to right. Time block 30 depicts the minimum time required for a single tuner to completely re-tune when a channel change instruction is received. Time blocks 32a-32j depict a series of channel changes using the television 10 of FIG. 1 when sequential

channel instructions, e.g. a series of "channel up" signals, are received. In block 32a, Tuner 1 is tuned (or preemptively tuned) and coupled to the display 12 in response to signal 1. While Tuner 1 is tuning, Tuner 2 is preemptively tuned to the next channel in the sequence in anticipation of signal 2, as indicated in block 32b.

When signal 2 is received, Tuner 2 is coupled to the display 12, and as indicated in block 32c, Tuner 1, now decoupled from the display 12, is preemptively tuned in anticipation of signal 3, and so on until signal 10 is received, whereupon Tuner 2 is re-tuned in block 32j, (partially shown in dots to indicate the time for Tuner 2 to completely re-tune in response to signal 10. Thus, if a television user is "channel surfing," i.e. rapidly sequencing through the channels on the television set, the control system 24 cycles or "ping pongs" between Tuner 1 and 2, thereby reducing the time to change channels by as much as fifty percent, as explained further below.

Turning to FIG. 3, a second preferred embodiment of a television system 110 in accordance with the present invention is shown. Similar to the first preferred embodiment, the television system 110 includes a display 12, a video selector switch 20 and a control system 24. However, instead of dual internal tuners, the television system 110 has a first internal tuner 14, and a second external tuner, such as VCR 116, which is coupled to the television set 110 via line 122. For example, the video output of the VCR 116 may be detachably connected to an input port 124, such as the video input of the television system 110. The control system 24 is coupled to the VCR 116, for example via a control port 126 or a remote control (not shown), in addition to the internal tuner 14 and the video selector switch 20, whereby the control system 24 may control the VCR 116 and/or its tuner (not shown).

During use, the television system 110 operates similarly to the first preferred embodiment, except that the VCR 116 replaces the second internal tuner 16 (see FIG. 1), thereby eliminating the need for the second internal tuner. Thus, the control system 24 may cycle between the internal tuner 14 and the VCR 116 to preemptively tune the decoupled tuner and shorten sequential channel changing times.

Turning to FIG. 4, a third preferred embodiment of a television system 210 in accordance with the present invention is shown. The television 210 has a display 12, first and second internal tuners 14, 16, a video selector switch 20, and a control system 24,

similar to those previously described. In addition, an external tuner, such as a VCR 116, is also provided which is coupled to the video selector switch 20, similar to the arrangement described above. The control system 24 is coupled to the VCR 116, in addition to the pair of internal tuners 14, 16, thus further speeding up sequential channel changing.

FIG. 5C illustrates the operation of the television 210 of FIG. 4 or a similar three tuner system, which may include other alternative combinations of internal and/or external tuners (not shown). During use, for example, when a first signal indicating a sequential channel change is received, the first internal tuner 14 (represented by Tuner 1 in FIG. 5C) is tuned to a first channel or may already be preemptively tuned to the first channel (Channel 1 in FIG. 5C), and coupled to the display 12. The second internal tuner 16 (Tuner 2) is preemptively tuned to a second channel in the sequence (Channel 2), and the external tuner 116 (Tuner 3) is preemptively tuned to a third channel in the sequence (Channel 3). When a second signal indicating a sequential channel change is received, the second internal tuner 16 (Tuner 2) is coupled to the display 12 to display the second channel (Channel 2). The external tuner 116 (Tuner 3) is held at the third channel (Channel 3), and the first internal tuner 14 (Tuner 1), now decoupled from the display 12, is preemptively re-tuned to a fourth channel in the sequence (Channel 4). Although a particular sequence has been described, it is merely illustrative of the manner in which the control system 24 cycles or rotates through the tuners to more quickly provide information on the display 12 in response to sequential channel change instructions.

Thus, as illustrated in FIGS. 5A-5C, the present invention contemplates a television or other audiovisual device having a plurality of tuners, and a control system for cycling through the tuners, each tuner after the first reducing the time required to sequentially change channels. As indicated, the horizontal width of each block represents the time required to completely re-tune a single tuner. FIG. 5A shows the time required to change channels using conventional single tuner tuning, i.e. the single tuner is re-tuned in response to each signal to change channel, thereby requiring six full re-tune time periods to change channels through Channels 1-6.

In contrast, FIG. 5B represents the passage of time to sequentially change channels using a dual tuner audiovisual display in accordance with the present invention, such as the television 10 of FIG. 1 or the television system 110 of FIG. 3. Each tuner only tunes every

other channel, thus Tuner 1 only re-tunes to Channels 1, 3 and 5, while Tuner 2 re-tunes to Channels 2, 4 and 6. Thus, a dual tuner system may reduce the time to change channels by at least about forty percent, and possibly by as much as about fifty percent.

As shown in FIG. 5C, with three tuner tuning, the individual tuners re-tune only to every third channel. Accordingly, the time to sequentially change channels may be reduced to as little as about thirty three percent of the time required using single tuner tuning, as will be appreciated by those skilled in the art. Additional tuners may be added, if desired, each providing a proportional reduction in channel changing time. Although previously television tuners were expensive devices, with the development of integrated internal tuners, a bank of tuners of any desired number may be provided without substantially increasing the cost of the televisions, yet providing improved fast tuning for television systems.

While the invention is susceptible to various modifications, and alternative forms, specific examples thereof have been shown in the drawings and are herein described in detail. It should be understood, however, that the invention is not to be limited to the particular forms or methods disclosed, but to the contrary, the invention is to cover all modifications, equivalents and alternatives falling within the spirit and scope of the appended claims.

WHAT IS CLAIMED IS:

1. An audiovisual display system, comprising:

a display;

a plurality of tuners adapted for connection to a source of information;

a selector coupled to the plurality of tuners to selectively couple one of the plurality of tuners to the display; and

a control system coupled to the plurality of tuners and the selector for toggling the selector in response to channel change instructions to cyclically couple one of the plurality of tuners to the display, the control system being adapted when a first tuner of the plurality of tuners is coupled to the display in response to a first sequential channel change instruction to preemptively tune a second tuner of the plurality of tuners to a sequential channel, whereby when a second sequential channel change instruction is received, the control system toggles the selector to couple the second tuner of the plurality of tuners to the display.

2. The audiovisual display system of claim 1, wherein the control system comprises a microcomputer.

3. The audiovisual display system of claim 1, further comprising a user interface adapted to provide channel change instructions.

4. The audiovisual display system of claim 3, wherein the user interface is a remote control including an input for providing sequential channel change instructions.

5. The audiovisual system of claim 1, wherein the sequential channel change instruction comprises one of a channel up signal, a channel down signal, or a super quick view signal.

6. The audiovisual system of claim 1, wherein the plurality of tuners includes an internal tuner and an external tuner.

7. The audiovisual system of claim 6, wherein the external tuner is detachably coupled to the selector and the control system.

8. The audiovisual system of claim 6, wherein the external tuner comprises a VCR.

9. A fast tuner audiovisual display system, comprising:

a display;

a plurality of tuners adapted for connection to a source of information;

a selector coupled to the plurality of tuners to selectively couple one of the plurality of tuners to the display; and

a control system coupled to the plurality of tuners and the selector for toggling the selector in response to channel change instructions to cyclically couple one of the plurality of tuners to the display, wherein, when a first sequential channel change instruction is received, the control system decouples a tuner coupled to the display, couples a decoupled tuner to the display, and preemptively tunes one or more decoupled tuners to a sequential channel in anticipation of a second sequential channel change instruction.

10. The fast tuner audiovisual system of claim 9, wherein the control system includes a comparator for detecting a selection pattern when a second channel change instruction is received, whereby when a selection pattern is detected, the control system couples a preemptively tuned tuner to the display, and preemptively tunes one or more decoupled tuners to a sequential channel.

11. The fast tuner audiovisual system of claim 10, wherein the control system includes memory for storing the first channel change instruction, and wherein the comparator compares the first and second channel change instructions, whereby when the second and first channel change instructions comprise the same sequential channel change instruction a selection pattern is detected.

12. A fast tuner television system, comprising:

a television display;

a first internal tuner adapted for connection to a source of information;

an input port for receiving a television signal from an external tuner connected to the source of information;

a selector coupled to the first internal tuner and the input port to selectively provide information from a channel from the source of information to the display;

a user interface for providing channel change signals; and

a control system coupled to the internal tuner and to a control port adapted for connection to the external tuner, the control system being adapted for toggling the selector in response to channel change signals received from the user interface to cyclically couple one of the tuners to the display, the control system being adapted when a first of the tuners is coupled to the display in response to a first sequential channel change instruction to preemptively tune a second of the tuners to a sequential channel, whereby when a second sequential channel change instruction is received, the control system toggles the selector to couple the second of the tuners to the display.

13. The fast tuning television set of claim 12, further comprising a second internal tuner coupled to the selector and control system.

14. A method of fast tuning an audiovisual display system including a display and first and second tuners, the method comprising the steps of:

receiving a first signal indicative of a channel change;

coupling the first tuner to the display in response to the first signal;

preemptively tuning the second tuner;

receiving a second signal indicative of a channel change;

comparing the first and second signals to detect a selection pattern; and

coupling the preemptively tuned second tuner to the display when a selection pattern is detected.

15. The method of claim 14, wherein the first and second signals comprise sequential channel change signals, and wherein a selection pattern is detected when the first and second signals comprise the same sequential channel change signal.

16. The method of claim 14, wherein the first tuner is tuned to a first channel during the step of coupling the first tuner to the display, and wherein the step of preemptively tuning the second tuner comprises the step of tuning the second tuner to a second channel sequential to the first channel.

17. A method of fast tuning an audiovisual display system including a display and first and second tuners, the method comprising the steps of:

receiving a first signal indicative of a channel change;

coupling the first tuner to the display in response to the first signal;

detecting a sequential channel change instruction in the first signal; and

preemptively tuning the second tuner to a sequential channel when a sequential channel change instruction is detected in the first signal.

18. The method of claim 17, wherein the sequential channel change instruction comprises one of a channel up signal, a channel down signal or a super quick view signal.

19. The method of claim 17, wherein the audiovisual display comprises a third tuner, and wherein the method comprises the additional step of preemptively tuning the third tuner to another sequential channel when a sequential channel change instruction is detected in the first signal.

20. The method of claim 17, comprising the additional steps of:

receiving a second signal indicative of a channel change;

detecting a selection pattern; and

coupling the second tuner to the display when a selection pattern is detected.

21. The method of claim 21, wherein the step of detecting a selection pattern comprises the step of comparing the first and second signals, and wherein a selection pattern is detected when the first and second signals comprise the same sequential channel change instruction.

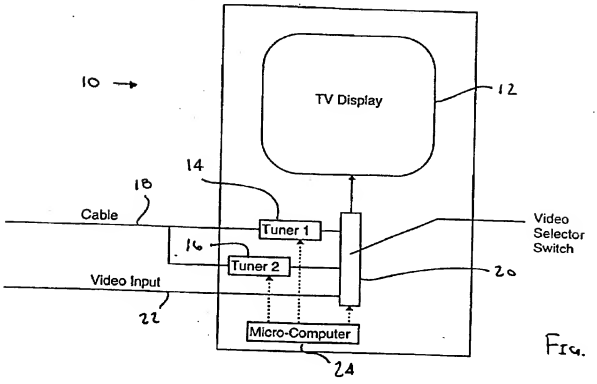

10
TV Display
12
14
18
Cable
Tuner 1
16
Tuner 2
Video Input
22
Micro-Computer
24
Video Selector Switch
20

Fig. 1

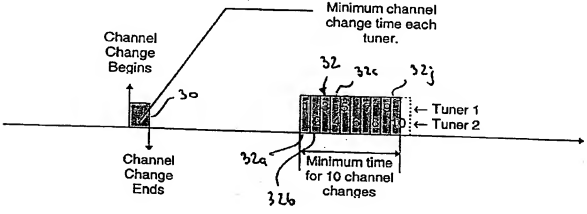
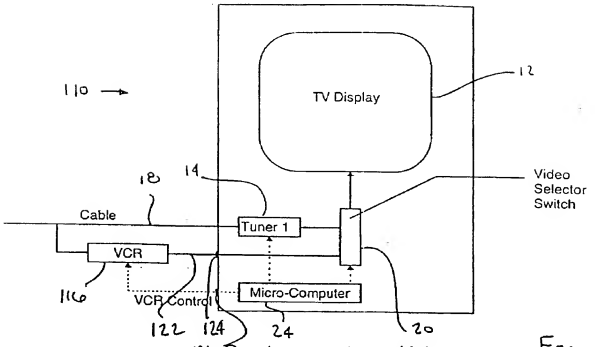
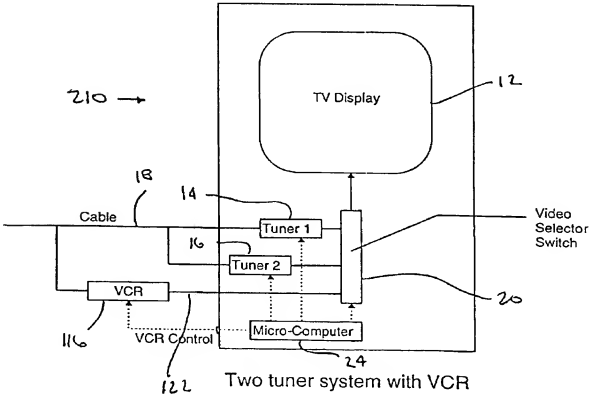

Minimum channel change time each tuner.
Channel Change Begins
30
32
32c
32j
Tuner 1
Tuner 2
32a
Minimum time for 10 channel changes
32b
Channel Change Ends

Fig. 2



One tuner system with VCR

Fig. 3



Two tuner system with VCR

Fig. 4

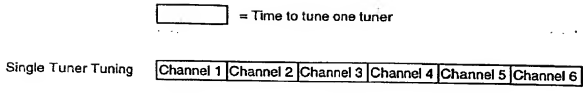


Fig. 5A

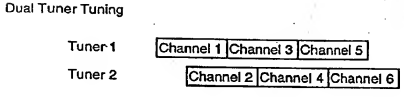


Fig. 5B

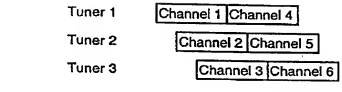


Fig. 5C